

Claims:

1 1. A method by a transmitter for processing frames in a FIFO transmit queue
2 during each of successive transmission intervals, the frames received across a variable
3 delay interface from a scheduler system, comprising:

4 detecting frames enqueued into the transmit queue;

5 detecting marked frames that are marked as transition frames as compared to
6 unmarked frames;

7 for each allowed transmission interval while bypassing is not active, dequeuing
8 and transmitting enqueued unmarked frames during an interval until there is insufficient
9 time remaining in the interval to transmit another frame or until a marked frame is
10 detected during the interval;

11 during each allowed transmission interval while bypassing is not active, ending
12 transmission from the transmit queue when a marked frame is detected; and

13 while bypassing is active, dropping enqueued unmarked frames until a marked
14 frame is detected.

1 2. The method of claim 1, further comprising:

2 if an enqueued marked frame is detected, clearing a mark of the marked frame so
3 that the frame becomes an unmarked frame.

1 3. The method of claim 2, further comprising

2 activating bypassing if a marked frame has not been detected during an interval;

3 and

4 if a marked frame is detected while bypassing is active, clearing a mark of the
5 marked frame so that it becomes an unmarked frame and deactivating bypassing.

1 4. The method of claim 1, further comprising:
2 enabling queue mark operation if a marked frame is detected while queue mark
3 operation is not active;
4 incrementing a bypass variable each time an interval ends without detecting a
5 marked frame; and
6 disabling queue mark operation if the bypass variable reaches a bypass limit.

1 5. The method of claim 4, further comprising:
2 ending transmissions during an interval upon detecting a marked frame during the
3 interval while queue mark operation is active or upon timeout of the interval or if there is
4 insufficient time in the interval to transmit another frame.

1 6. The method of claim 5, further comprising:
2 transmitting an end of interval frame to end the interval early.

1 7. The method of claim 5, further comprising:
2 ceasing transmissions in order to end the interval early.

1 8. The method of claim 5, further comprising:
2 ceasing transmissions early by sending a frame with a control field that indicates
3 final transmission.

1 9. The method of claim 4, upon detecting a marked frame while queue mark
2 operation is not enabled, further comprising:
3 clearing a mark of the marked frame so that the frame becomes a previously
4 marked frame;

5 transmitting the previously marked frame if there is sufficient time remaining in a
6 current interval; and

7 incrementing the bypass variable if there is insufficient time remaining in the
8 current interval to transmit the previously marked frame.

1 10. The method of claim 4, further comprising:

2 setting the bypass variable to zero if queue mark operation is disabled because the
3 bypass variable had reached the bypass limit.

1 11. The method of claim 1, further comprising:

2 reporting to the scheduler system whether a frame was successfully transmitted.

1 12. A method of synchronizing data transmission between a computer system
2 and a transmitter across a variable interface with variable delay and latency, comprising:
3 marking, by the computer system, transition frames between successive
4 transmission intervals;
5 transferring, by the computer system, consecutive frames across the variable delay
6 interface to the transmitter, the consecutive frames including any marked frames;
7 enqueueing, by the transmitter, the frames transferred via the variable delay
8 interface into a FIFO transmission queue;
9 detecting, by the transmitter, marked frames that are marked as transition frames
10 as compared to unmarked frames;
11 ending, by the transmitter during each interval while bypassing is not active,
12 enqueued unmarked frames until the interval times out or until there is insufficient time
13 remaining in the interval to transmit another frame or until a marked frame is detected;
14 terminating, by the transmitter during each interval while bypassing is not active,
15 transmission from the transmit queue when a marked frame is detected; and
16 dropping, by the transmitter while bypassing is active, enqueued unmarked frames
17 until a marked frame is detected.

1 13. The method of claim 12, further comprising:
2 clearing, by the transmitter if an enqueued marked frame is detected, a mark of
3 the marked frame so that the frame becomes an unmarked frame.

1 14. The method of claim 13, further comprising
2 activating, by the transmitter, bypassing if a marked frame has not been detected
3 during an interval; and

deactivating, by the transmitter, bypassing if a marked frame is detected while bypassing is active.

15. The method of claim 14, further comprising:
enabling, by the transmitter, queue mark operation if a marked frame is detected while queue mark operation is not enabling;
incrementing, by the transmitter, a bypass variable each time an interval ends without detecting a marked frame; and
disabling, by the transmitter, queue mark operation if the bypass variable reaches a bypass limit.

16. The method of claim 15, further comprising:
ending, by the transmitter, an interval upon detecting a marked frame during the interval while queue mark operation is enabling or upon timeout of the interval or if there is insufficient time in the interval to transmit another frame.

17. The method of claim 15, further comprising:
clearing, by the transmitter upon detecting a marked frame while queue mark operation is not enabled, a mark of the marked frame so that the frame becomes a previously marked frame;
transmitting, by the transmitter, the previously marked frame if there is sufficient time remaining in a current interval; and
incrementing, by the transmitter, the bypass variable if there is insufficient time remaining in the current interval to transmit the previously marked frame.

18. The method of claim 15, further comprising:

2 setting, by the transmitter, the bypass variable to zero if queue mark operation is
3 disabled because the bypass variable had reached the bypass limit.

1 19. The method of claim 12, further comprising:
2 indicating, by the computer system, whether to report transmission status of a
3 frame; and
4 reporting, by the transmitter to the computer system, whether the frame was
5 successfully transmitted or dropped.

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1 20. A computer system configured for wireless communications across a
2 wireless medium, comprising:

3 a scheduler that transfers frames for transmission via an interface with variable
4 delay and latency;

5 the frames including marked frames that are each intended for transmission as a
6 first frame of a selected interval of successive transmission intervals;

7 a transmitter, coupled to the variable interface of the scheduler, that enqueues
8 frames received via the variable interface into a FIFO transmission queue, that transmits
9 unmarked frames for each interval until the interval times out or until there is insufficient
10 time remaining in the interval to transmit another frame or until a marked frame is
11 detected during the interval while bypassing is not active; and

12 the transmitter ending transmission from the transmit queue when a marked frame
13 is detected during the interval while bypassing is not active, and dropping unmarked
14 frames until a marked frame is detected while bypassing is active.

1 21. The computer system of claim 20, wherein the scheduler further
2 comprises:

3 a memory system that stores software including an operating system, a wireless
4 application and a host driver;

5 a processor, coupled to the memory, that executes software from the memory
6 system including the operating system, the wireless application and the host driver; and

7 a bus system coupled to the memory system and the processor.

1 22. The computer system of claim 20, wherein the transmitter further
2 comprises:

3 a host interface;

4 at least one FIFO transmit queue;

5 a transmit frame manager, coupled to the host interface and the at least one FIFO
6 transmit queue, that enqueues frames received via the variable interface into a selected
7 FIFO transmission queue;

8 an antenna;

9 a transmitter coupled to the antenna for sending and receiving frames; and

10 a transmission scheduler, coupled to the transmitter and the at least one FIFO
11 transmit queue, that processes enqueued frames.